(12) UK Patent Application (19) GB (11) 2 240 332 (13) A

(43) Date of A publication 31.07.1991

(21) Application No 9100891.2

(22) Date of filing 16.01.1991

(30) Priority data
(31) 9001741 (32) 25.01.1990 (33) GB
9017829 14.08.1990

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(51) INT CL[5]
B65D 45/02 // A47G 19/26 23/04, B65D 25/00, F25D 9/00

(52) UK CL (Edition K)
B8T THMX T17A1 T17C2 T17X
B8D DCW21 D1A1 D1A2A D1A3 D1B1 D7M D7PY
F4U U52D
U1S S1106 S1803 S1809

(56) Documents cited
US 4752016 A US 4745776 A US 4703873 A
US 4429798 A US 4262813 A US 3730374 A

(58) Field of search
UK CL (Edition K) B8D DCW21 DFC, B8T THMX, F4U U52B U52D
INT CL[5] A47G 19/26 23/04, B65D 17/00 23/08 25/00 25/20 45/00 45/02 45/04 45/06 45/16 45/20 45/24 45/26, F25D
Online databases: WPI

# (54) A closure device

(57) A closure device for closing an opened carbonated beverage can has a seal 18, which seals around the rim of the can 22. The seal is pulled down onto the rim of the can by a part of the device which engages under the bottom of the can. The device may comprise a cap 12 and a base 10 which together form an enclosure into which the can may be placed, and the walls of the enclosure may be insulated to keep the can and its contents cool. In a further embodiment an upper frame (46 Fig. 11) is pulled down by tensioning straps (52).

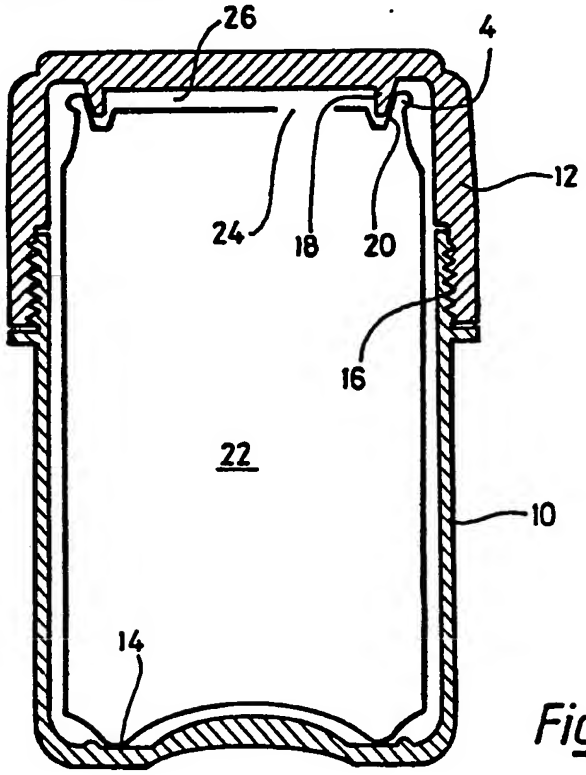


Fig. 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.



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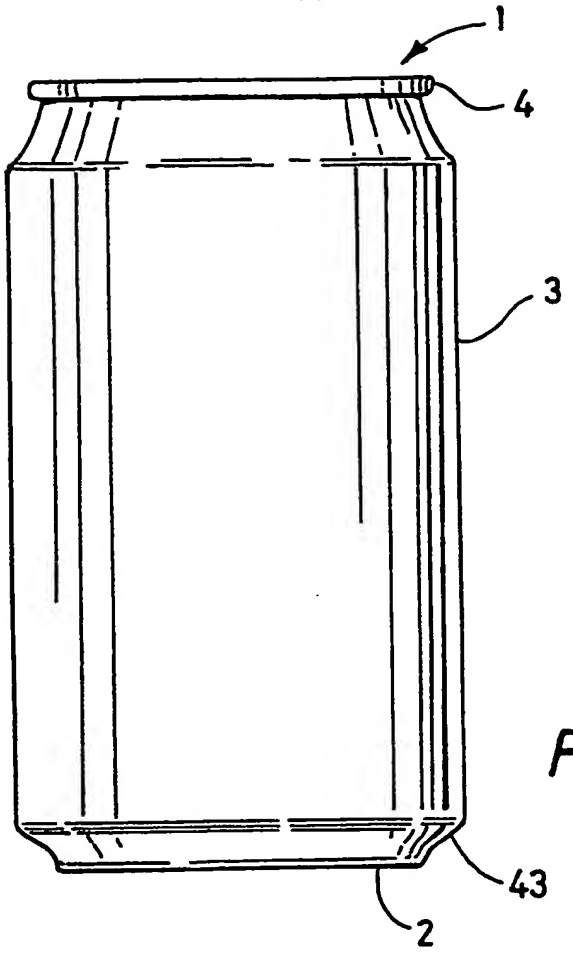


Fig. 1

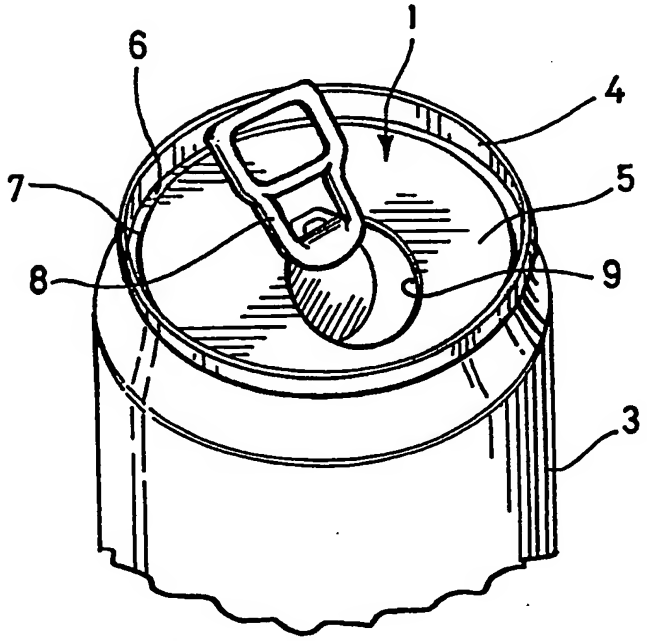


Fig. 2

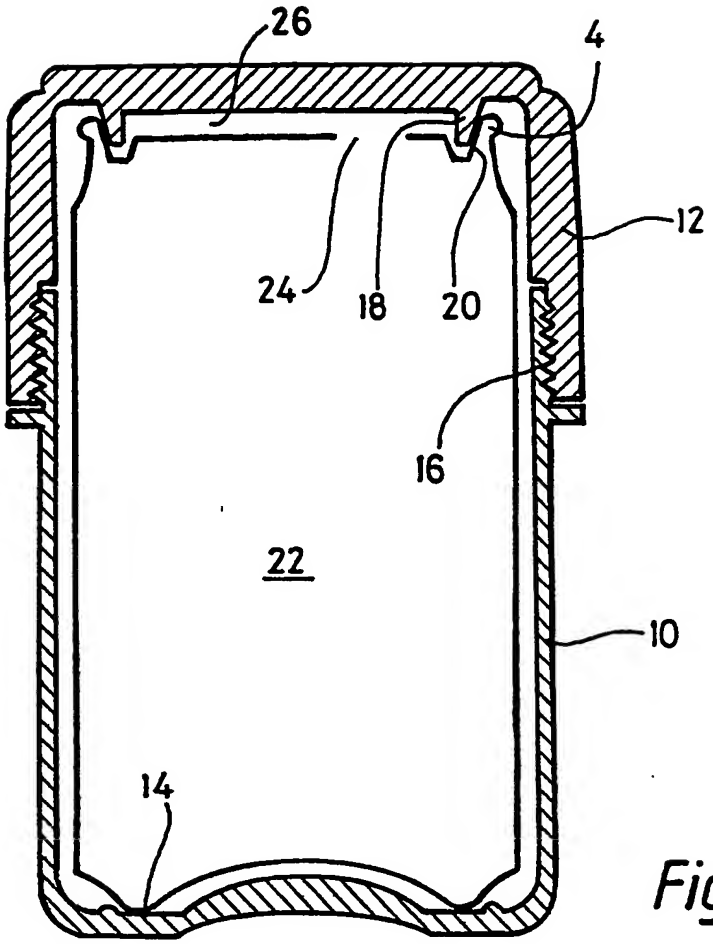


Fig. 3

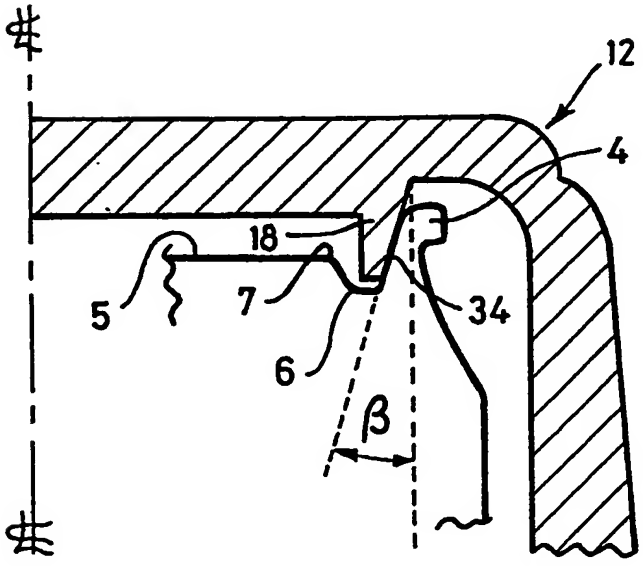


Fig. 4

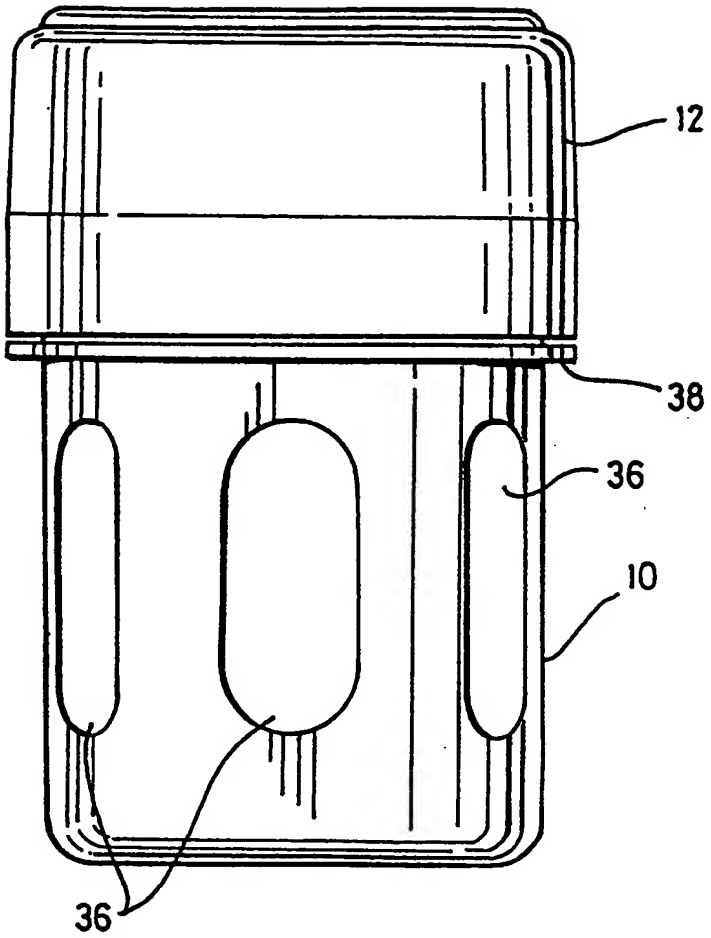


Fig.5

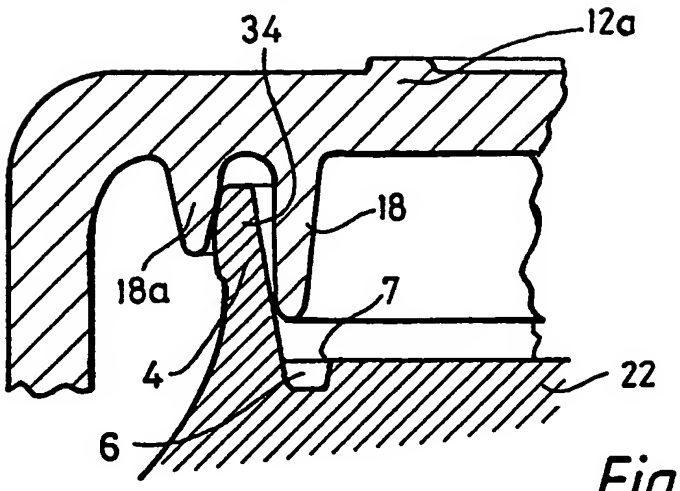


Fig.6

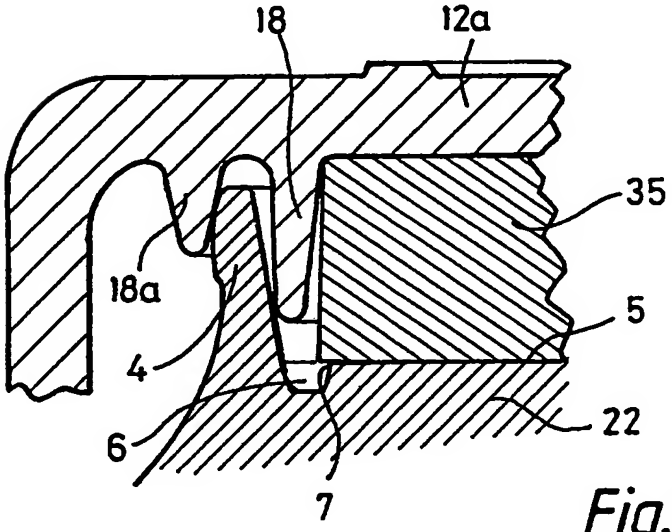


Fig.7

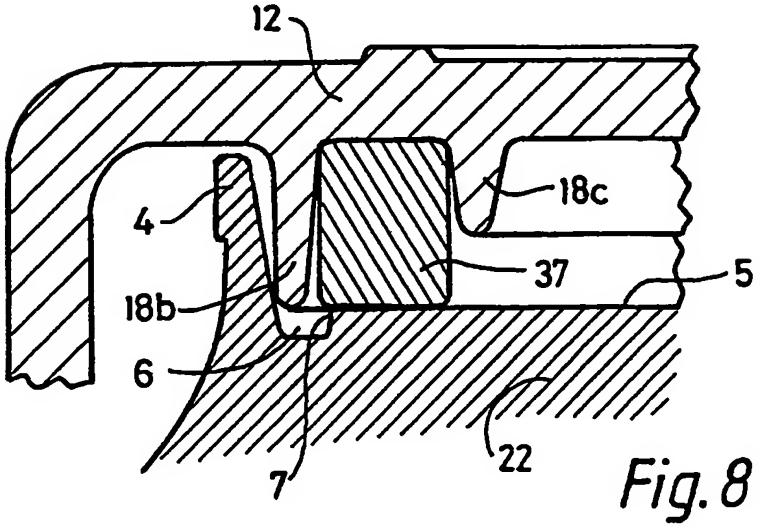


Fig.8

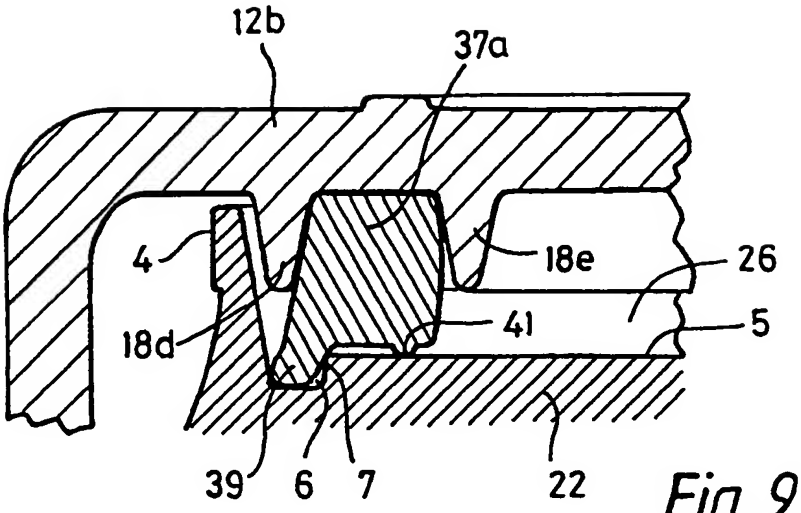


Fig. 9

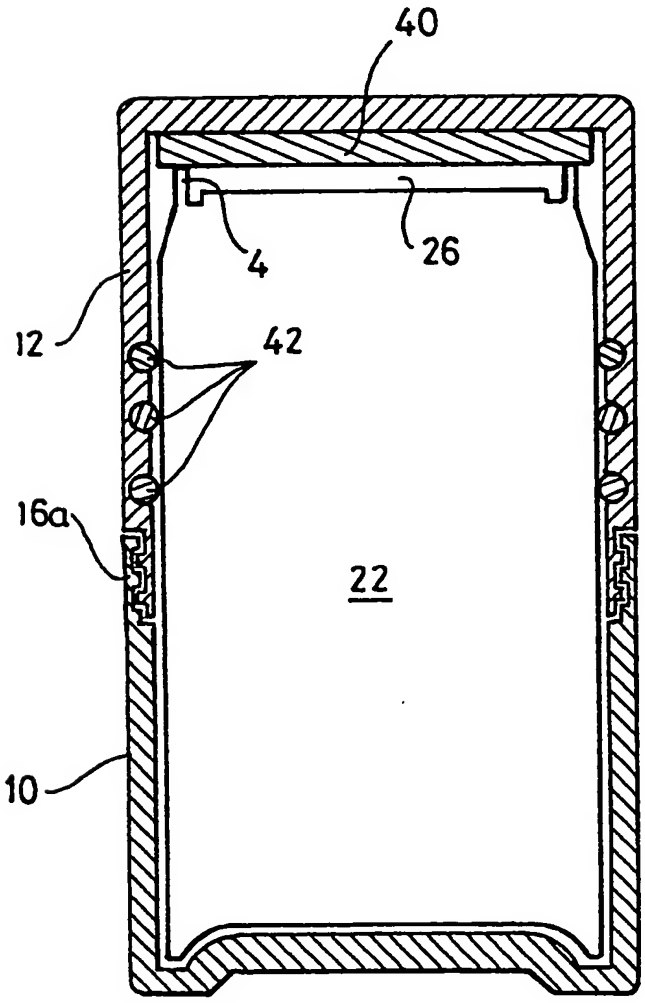


Fig. 10

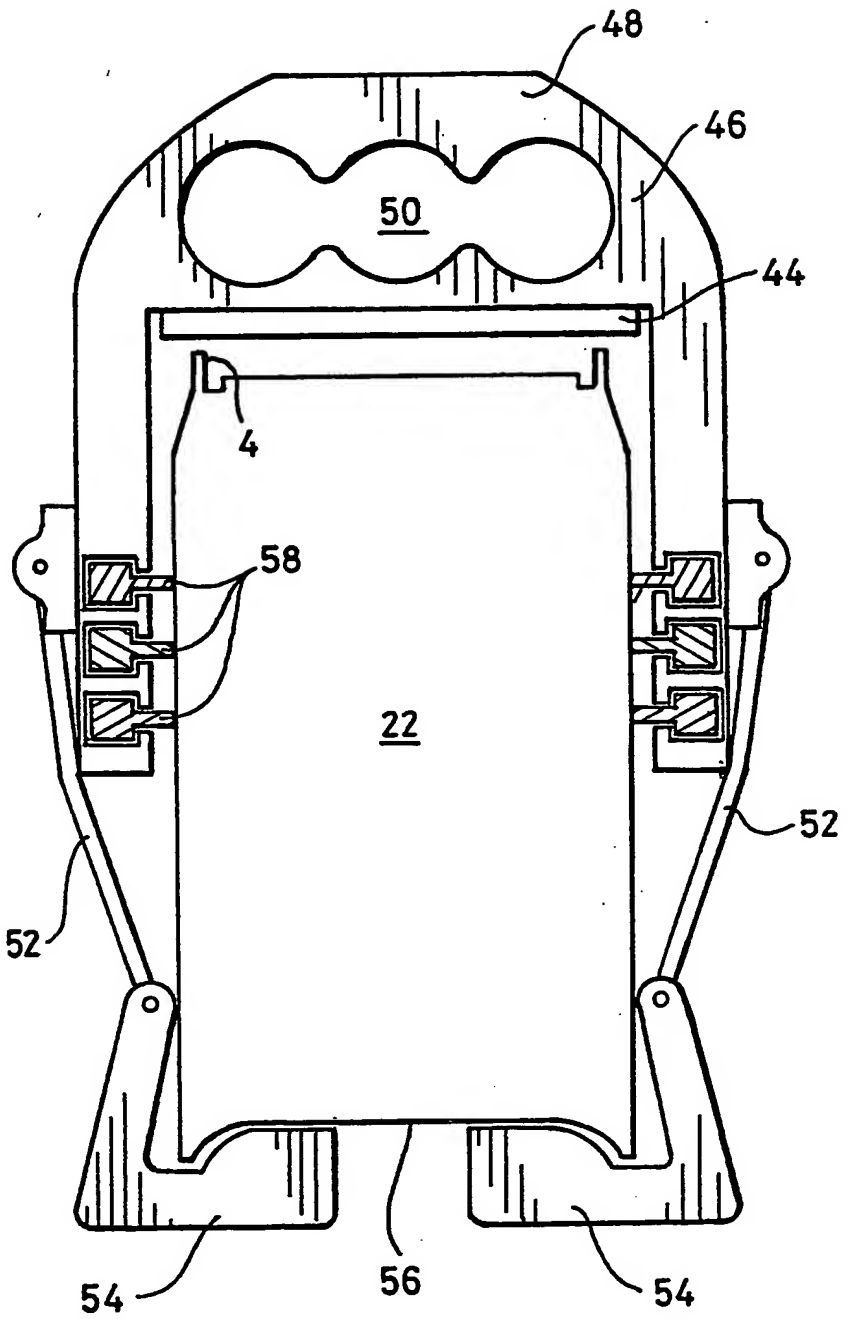


Fig. 11

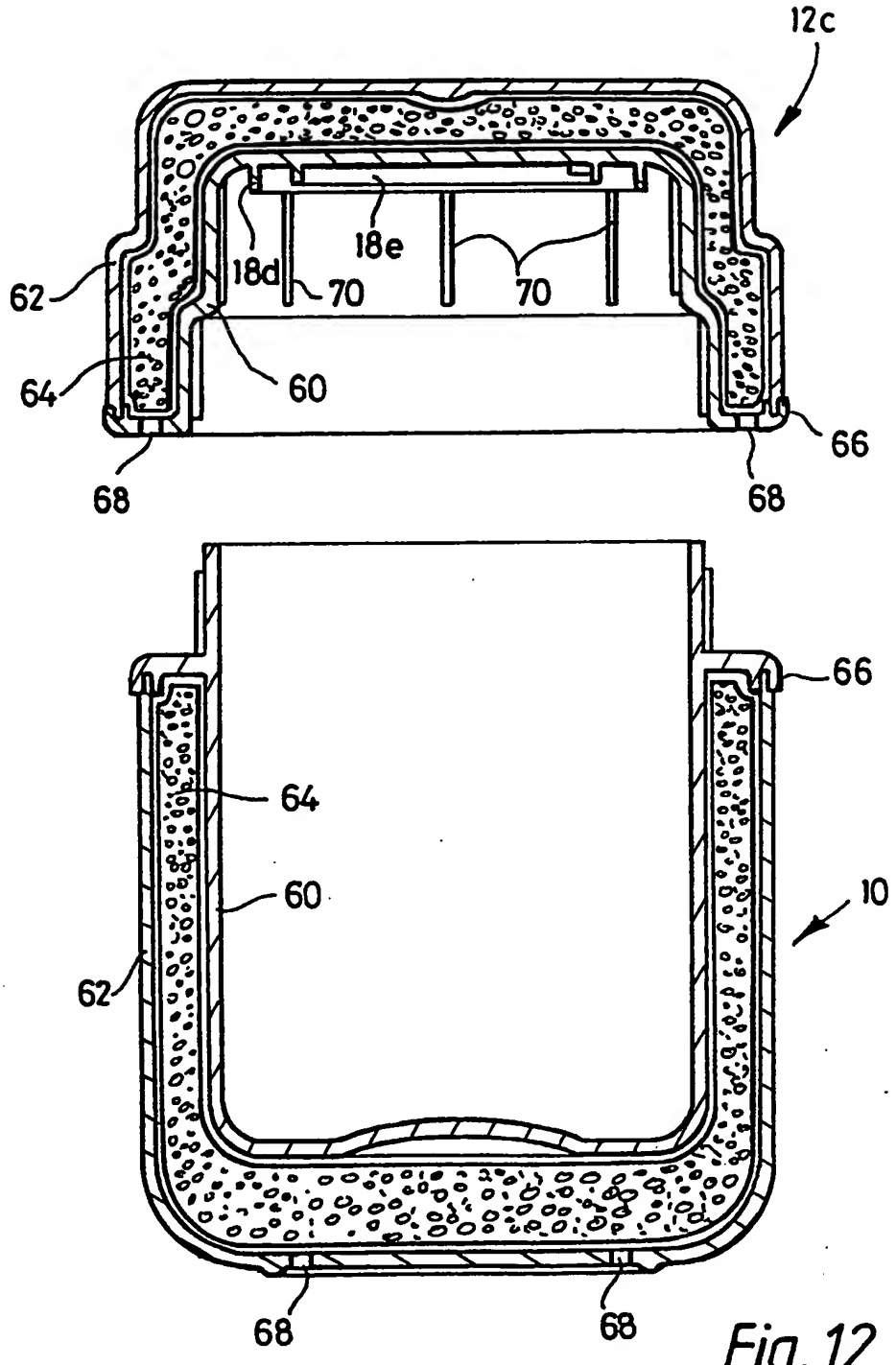


Fig. 12

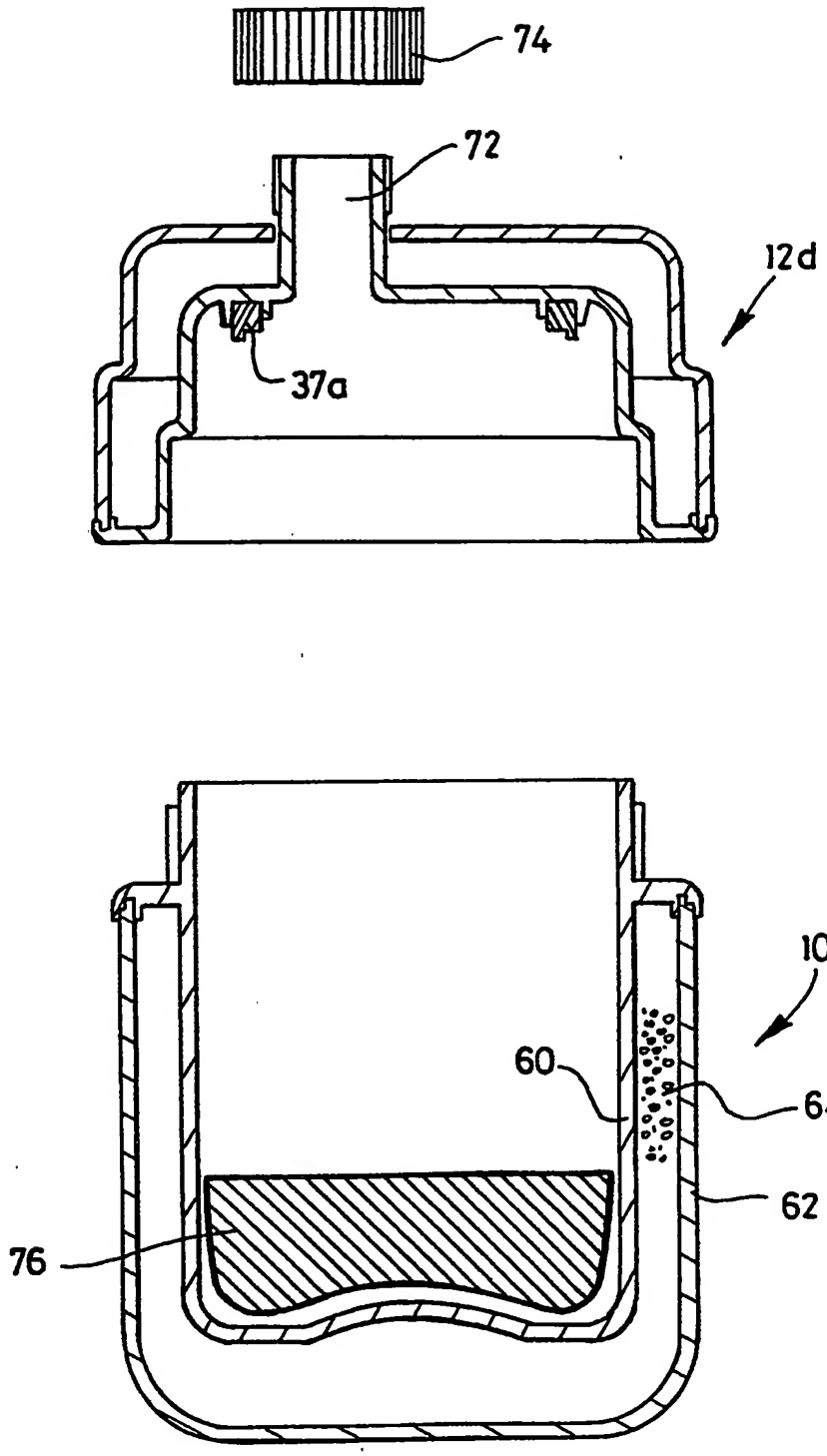


Fig. 13

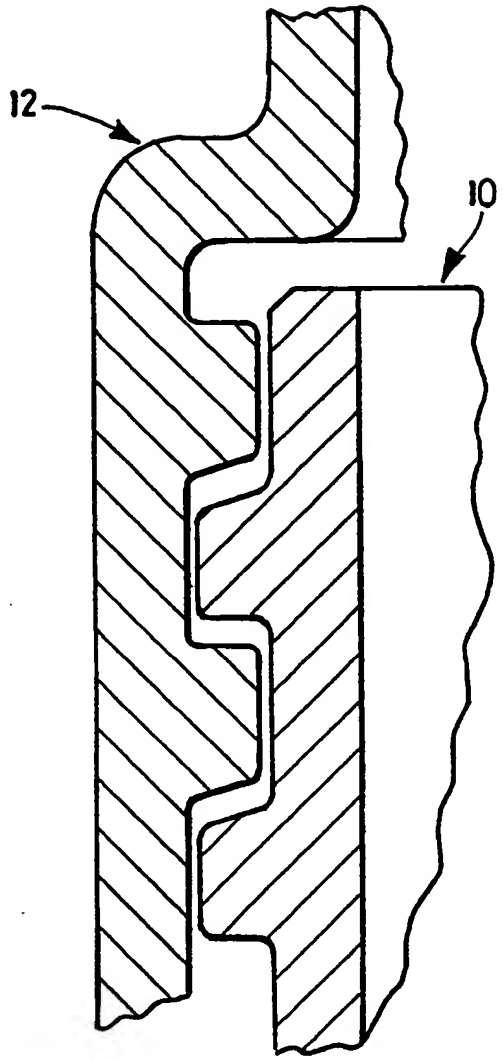


Fig. 14

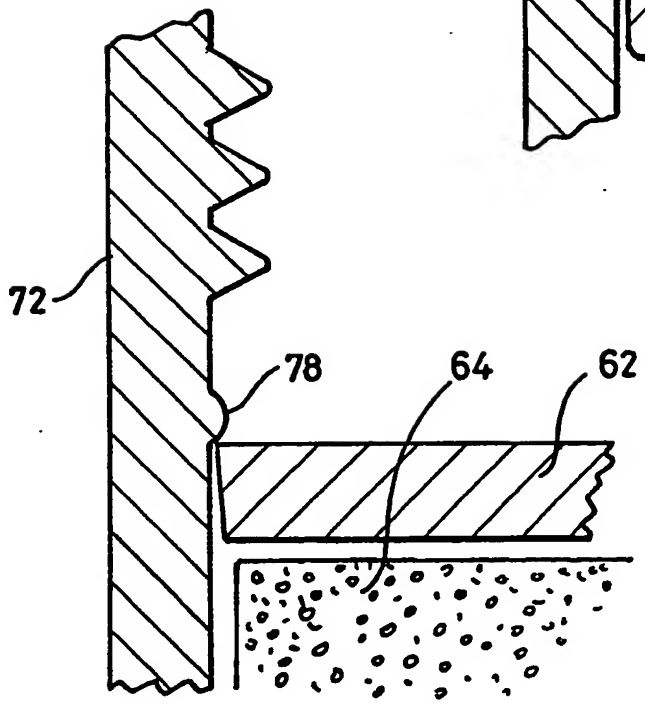


Fig. 15

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# A CLOSURE DEVICE

This invention relates to a closure device for closing an opened carbonated beverage can.

Carbonated beverages, otherwise known as fizzy drinks, are sold in cans which conventionally have a ring-pull opening mechanism. When a ring secured to the top of the can is pulled, part of the top of the can itself is removed to leave a hole through which the drink can be dispensed. A problem with such cans is that the opening cannot be resealed by the ring-pull mechanism. Thus if one wants to drink only part of the can contents, then the remainder of the contents cannot be kept fresh. Also, if the opened can is to be carried about, or is to be carried in a moving vehicle, then there is the risk of the contents being spilt.

The shape of the opening which is revealed in the top of the can when the ring is pulled varies from manufacturer to manufacturer. In some cases the ring remains attached to the can, and because of this variation it is not practical to provide a resealable top which cooperates with the aperture itself, although there are proposals in existence which aim to work in this way (see for example EP-B-0 112 306 and GB-A-2 210 028).

According to the present invention, there is provided a closure device for closing an opened carbonated beverage can, the device comprising a seal adapted to seal against a peripheral annular region of the can which surrounds the opening of the can, and seal securing means which act against the bottom of the can to secure the seal against the annular region.

Many carbonated beverage cans have an outer rim and an

inner rim, an annular gutter between the two rims and a top surface inside the inner rim and in which the opening of the can is located. In such a can, the seal may act against the inner rim, the outer rim, in the gutter or against an outer annular part of the top surface.

The seal may act against the inner base of the outer rim, against the top of the outer rim (which will generally be higher than the inner rim) or, as is preferred, against the top of the inner rim where this connects with the top surface.

The seal preferably has a diameter of between 50 and 60mm so that it will provide a seal on the rim of a conventional drinks can.

The seal may be formed by a flexible seal ring mounted in a lid. The seal ring can be a push-fit in an annular socket in the lid. Alternatively, the lid may have an internal integral formation which forms the seal.

In a preferred form, the device is formed in two parts; a cap which carries the seal, and a cup-like base. The base locates under the bottom of a can or in a step near the bottom of the can, and the cap and the base can be secured together in such a way that a tension force is created in the device between the bottom of the can and the cap to pull the seal against the rim of the can. This force is counteracted by a compression force arising in the walls of the can.

Because the seal seals against a peripheral annular region of the can which is concentric with the can itself, the cap can be secured onto the base by screwing together threads formed on the cap and the base. The axis of rotation on which the screw threads are screwed together will

correspond with the axis of the cylindrical can. The complementary threads are part of the seal securing means which produce the desired tension force in the device. There may be a stop formed to prevent overtightening which might lead to crushing of the can.

To allow quick release of the internal pressure, a valve can be provided in the cap. This valve may operate automatically to release pressure above a certain threshold pressure, or may be user operated, for example so that the pressure can be released before the cap is opened.

Instead of a base into which the can is inserted, the seal may be provided with legs or other tension members which engage under the bottom of the can and which can be placed in tension to pull the seal onto the lip.

Where a base and a cap are used, they may be provided with thermal insulation to keep the can and its contents cool. The insulation may be an integral part of the material of the base and/or the cap, or alternatively may be provided by a filling between inner and outer skins which form the base and the cap. If desired, drainage holes can be fitted in the base of a thermally insulated device so that condensation can drain away.

The external wall of the cap and the wall of the base may be provided with ribbing or the equivalent to help in screwing and unscrewing the cap from the base. Alternatively either the base or the cap or both may have apertures formed in their walls. This can help to prevent condensation forming on the wall of the can as well as providing a grip for the hands and exposing part of the can itself so that the identity of the can inside the device can be established.

Where the device is to be used with cans of a different volume, the base may be designed to accommodate the largest can size, and when a smaller can size is to be used, a packing slug can be placed in the base before the can is put in, to occupy the extra volume. The slug may be made of or may contain a material which can be frozen before use and which will be in contact with the can to assist in keeping the can contents cool.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a conventional fizzy drinks can;

Figure 2 is a perspective view of the top of the can of Figure 1, with the can opened;

Figure 3 shows a cross section through a closure device in accordance with the invention, with the can of Figures 1 and 2 shown in position;

Figure 4 is a detail of part of the cap from Figure 3;

Figure 5 is an external view of the closure device of Figures 3 and 4;

Figure 6 is a view corresponding to Figure 4 but showing a second embodiment;

Figure 7 is a view corresponding to Figure 4 but showing a third embodiment;

Figure 8 is a view corresponding to Figure 4 but showing a fourth embodiment;

Figure 9 is a view corresponding to Figure 4 but showing a fifth embodiment;

Figure 10 shows a section through a sixth form of closure device in accordance with the invention;

Figure 11 is a view corresponding to Figure 10 but showing a seventh embodiment of closure device in accordance with the invention;

Figure 12 is a cross-section through an eighth embodiment of closure device in accordance with the invention;

Figure 13 is a cross-section through a ninth embodiment of closure device in accordance with the invention;

Figure 14 is a detail of a thread form for use with the closure device of the invention; and

Figure 15 is a detail of part of the construction of the ninth embodiment.

The can shown in Figure 1 has a top 1, a bottom 2 and side walls 3. The top has an outer rim 4. At the top of the can (see Figure 2) a top surface 5 is surrounded by a gutter 6, with an inner rim 7 forming the outer edge of the top surface. A ring-pull closure 8 can be pulled to open a dispensing opening 9.

The closure device shown in Figure 3 consists of a base 10 and a cap 12. The base and the cap define a cavity between them which is dimensioned so as to receive a standard sized drinks can, for example a 330 ml fizzy drink can as shown in Figures 1 and 2. The bottom of the can sits on the

bottom 14 of the base 10. When the cap 12 is screwed onto the base using the thread 16, an internal annular ridge 18 on the cap 12 will engage with the inner flank 20 of the outer rim 4 on the can 22 to form a seal. The thread 16 can be a coarse thread with a number of starts.

The can 22 has had its ring pull closure removed so that the top of the can has an opening 9. This opening now communicates with a space 26 above the can, but this space is bounded by the seal formed between the ridge 18 and the flank 20. If the can is shaken around, some liquid from the can may pass through the opening 24 into the space 26, but it can go no further than this, and because of the nature of the seal between the ridge and the flank, pressure tightness of the can will be maintained. Where the can has a ring-pull of the type which remains attached to the can, as seen in Figure 2, then this ring-pull can be accommodated in the space 26.

Figure 4 shows one type of sealing arrangement in more detail. The can 22 has a top surface 5, an annular gutter 6 around the outside of the surface 5, an inner rim 7 and an outer rim 4. Between the gutter 6 and the rim 4 is a flank 34. The cans in which fizzy drinks are sold are standard dimensions. For cans sold in the UK, the angle which the flank 34 makes to the vertical ($\beta$) is approximately 17°. The diameter of the top of the outer rim 4 is about 57mm. Cans sold in other countries may have different dimensions, but the skilled man will be able to modify the profile and position of the rim 4 in this embodiment to provide the required seal. The external diameter and the flank angle of the ridge 18 are chosen such that the ridge will not bottom in the channel 30; neither will the rim 4 come into contact with the top of the cap. Instead a seal is achieved over a wide area of the flank 34.

Figure 5 shows the exterior of the closure device. It will be seen in this Figure that the base 10 has oval shaped cut-outs or apertures 36 which allow the can to be seen in the interior of the device, and also allow air to circulate around the can to prevent condensation being formed on the outside of the can. Figure 3 also shows a shoulder 38 on the base 10 which forms a stop for screwing up movement of the cap 12 to prevent overtightening taking place.

Figure 6 illustrates on a larger scale, an alternative embodiment where the sealing function is performed in a slightly different manner. The cap 12a of the closure device of Figure 6 has two internal ridges 18 and 18a. The ridge 18 seals against the flank 34 in much the same manner as shown in Figure 4, and the ridge 18a provides a back-up seal against the outer edge of the outer rim 4. This therefore provides a double seal.

Figure 7 shows the same cap 12a, but this time with a body 35 of closed cell polyethylene foam retained in the cap by the ridge 18. This foam pad does not take part in the hermetic sealing of the can but does prevent any substantial volume of liquid entering the space 26 and thus prevents mess when the device is opened.

In Figure 8, a different arrangement of internal ridges is used. In this Figure, the ridges are indicated by reference numerals 18b and 18c. Both ridges lie inside the circle of the rim 4 and between them define an annular socket 45 in which a seal ring 37 is fitted. In this case, a first seal is established between the ridge 18b and the flank 34 of the rim 4, and a second seal is established between the internal rim 7 and the seal body 37.

In Figure 9, the cap 12 has two internal ridges 18d and 18e which form an annular socket receiving an annular seal ring

37a. The ridge 18d is shorter than the ridge 18b of Figure 8 and does not itself form a seal. The sealing function in this embodiment is performed entirely by the ring 37a. However the bottom edge of the ring 37a is formed so that it creates a primary seal against the inner rim 7 and a secondary seal by the engagement of an outer lip 39 in the gutter 6. A rib 41 is also compressed against the top surface 5 of the can 22 to improve the 'feel' experienced by the user when screwing down the cap 12.

Figure 10 shows yet another embodiment where a base 10 and a cap 12 are screwed together on a square section thread 16a. A can 22 is shown in place inside the base and the cap, and it will be seen that the top internal face of the cap 12 has a disc-like seal 40 which is pressed against the top edge of the outer rim 4 of the can. The seal acts by being simply pressed down against the rim of the can as the cap is tightened on the base, and this forms a boundary to the space 26 formed above the can. In this embodiment also, three O-rings 42 are shown in the cap in order partly to act as a back up seal for the can contents, and secondly to prevent the can rattling inside the cap.

Figure 11 illustrates another embodiment which is shown in the condition before sealing has been accomplished. A seal disc 44 is mounted and supported on an upper frame 46. The upper frame 46 includes a handle portion 48 containing cut-outs 50 for the fingers. Tension straps 52 connect the frame 46 to feet 54 which engage under the base 56 of the can. The straps 52 can be tensioned by any suitable mechanism, for example an over-centre mechanism (not shown) which would pull the support member 46 down onto the can 22 to press the sealing disc 44 against the rim 32 of the can.

In Figure 11, lateral sealing strips 58 are also shown which act in the same way as the O-rings shown in Figure 4.

Although the closure devices shown in the preceding figures have not attempted in any way to provide thermal insulation for the can, such insulation can very easily be incorporated in the device. Figure 12 shows a base 10c and a cap 12c both of which have inner and outer skins 60, 62 with a layer 64 of thermal insulation between the skins.

The inner and outer skins 60, 62 are separate moulding (two mouldings for the base and two mouldings for the cap). The thermal insulation 64 if formed as a separate pre-formed component of a size sufficient to fit comfortably in the cavity between the inner and the outer skins. Forming the insulation in this way rather than foaming in place provides a quick and reliable assembly technique which does not require a waiting stage while a foam is formed and cures. After assembly of the three parts (inner skin, insulation and outer skin) the inner and outer skins are bonded permanently together by an ultra sonic weld around the joint 66.

The outer skin 62 of the base 10c also has drain holes 68.

The inner skins 60 of the base and of the cap carry the threads which connect the two parts and also the seal which, in use, will provide a seal at the top end of a drinks can. In Figure 12, the ridges 18d and 18e (see Figure 9) are shown, but with the sealing ring 37a of that Figure omitted. Figure 12 also shows axial ribs 70 which help to centre the cap when it is screwed onto the base with a can in place.

The threads 16 which connect the cap and the base are preferably coarse, multi-start threads (for example there may be three starts), and the thread profile as shown in Figure 14 has been found to be suitable. There is axial

play between the flanks of the thread until the cap is screwed up tight onto a can, at which time the play is taken up.

Figure 13 shows an insulated closure device with many of the features already described with reference to Figure 12. In Figure 13, the sealing ring 37a is shown in place. The base 10c does not differ from that shown in Figure 12, but the cap 12d has a pressure release passage 72 which is normally closed by a screw-on cap 74.

When an opened drinks can is inside the closure device, pressure can build up to quite a high level. When the pressure is high, the flanks of the thread 16 are forced firmly into contact with one another and it may be difficult to unscrew the cap from the base. In order to overcome this problem, the passage 72 can be opened by removing the screw-on lid 74. This will release the pressure and the cap 12d can then be unscrewed.

The passage 71 may also constitute a drinking spout.

The screw-on lid 74 may have a non-round shape so that it is easy to grip and turn.

The passage 72 can easily be incorporated in the manufacturing process by making the walls of the passage 72 integral with the inner skin 60; making a suitable cut-out in the insulation foam 64 and in the outer skin 62, and then assembling the outer skin over the spout-like end of the passage 72 in the manner indicated in figure 15 where the outer skin 62 snaps beneath an external bead 78.

Figure 13 also shows the use of a packing slug 76 which can be placed in the bottom of the base 10c when the device is to be used with a smaller can. With the slug 76 in place,

the bottom of the can will sit on the top of the slug so that the top of the can is in the correct relationship with the cap 12d. The use of such a slug, or a range of slugs of different sizes, can allow one device to be used with cans of a corresponding range of sizes.

The slug 76 may contain a material which can easily be frozen and which acts as a cooling device in the base, beneath the bottom of the can and in heat-transmitting contact with the base of the can.

The closure device shown in the various embodiments of the drawings is simple and effective to operate and serves the primary function of sealing the opened can without allowing any escape of gas which might allow the drink to go flat. It is helpful if the can is a tight fit in the base 10 so that once the cap has been unscrewed, the can can be held by holding the base.

The components of the closure device can be easily moulded from plastics materials. Food grade polypropylene, for example the material sold by Repsol of France under the Trade Mark Isplen and the designations PP/080 and PP/095 has been found to be suitable. In the embodiment shown in Figures 1 to 3, the sealing ring inside the cap can be integral with the cap material. Alternatively a separate sealing disc of the appropriate rubber hardness could be used. A suitable rubber is the thermoplastic rubber sold by the Monsanto company under the Trade Mark Santoprene, Grade 177.

It is an important part of the invention that the force which is needed to make and maintain a seal around the open part of the can is generated by fitting an abutment beneath the bottom of the can and then putting into tension linking means which connect the seal to the abutments. The

abutments do not need to completely enclose the bottom of the can; they may only engage under part of the can bottom as shown in Figure 11, or where the can has a stepped bottom formation as at 43 in Figure 1, the abutment may engage under the step at the bottom rather than fully under the bottom.

## Claims

1. A closure device for closing an opened carbonated beverage can, the device being characterized by a seal which is adapted to seal against a peripheral annular region of the can which surrounds the opening of the can, and seal securing means which act against the bottom of the can to secure the seal against the annular region.

2. A closure device as claimed in Claim 1, for use with a can which has a top with an outer rim and an inner rim, an annular gutter between the two rims and a top surface inside the inner rim and in which the opening of the can is located, characterized in that the seal acts against the inner rim.

3. A closure device as claimed in Claim 1, for use with a can which has a top with an outer rim and an inner rim, an annular gutter between the two rims and a top surface inside the inner rim and in which the opening of the can is located, characterized in that the seal acts against the outer rim.

4. A closure device as claimed in Claim 2, characterized in that the seal acts against the top of the inner rim where this connects with the top surface.

5. A closure device as claimed in any preceding claim, characterized in that the seal is formed by a flexible seal ring mounted in a cap.

6. A closure device as claimed in any preceding claim, characterized in that the device is formed in two parts; a cap which carries the seal, and a cup-like base which locates under the bottom of a can or in a step near the bottom of the can, and wherein the cap and the base can be

secured together in such a way that a tension force is created in the device between the bottom of the can and the cap to pull the seal against the rim of the can.

7. A closure device as claimed in Claim 6, characterized in that the cap can be secured onto the base by screwing together threads formed on the cap and the base.

8. A closure device as claimed in any preceding claim, characterized in that a valve can be provided in the cap to allow quick release of internal pressure in the device.

9. A closure device as claimed in any preceding claim, and which has walls forming an enclosure into which a can can be placed, characterized in that the walls are provided with thermal insulation to keep the can and its contents cool.

10. A closure device as claimed in Claim 9, characterized in that the insulation is provided by a filling between inner and outer skins which form the walls of the enclosure.

11. A closure device as claimed in any preceding claim, for use with cans of differing volumes, characterized in that a base of the device is designed to accommodate the largest can size, and is combined with a packing slug which can be placed in the base before the can is put in, to occupy the extra volume.

12. A closure device as claimed in Claim 11, characterized in that the slug is made of or contains a material which can be frozen before use and which will be in contact with the can to assist in keeping the can contents cool.

13. A closure device for closing an opened carbonated

beverage can, substantially as herein described with reference to any one embodiment shown in the accompanying drawings.

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